ACETABULAR RING PROSTHESIS WITH REINFORCEMENT BUTTRESS

BACKGROUND OF THE INVENTION

1. Field of the Invention

The present invention relates to medical orthopaedic surgical devices, and more particularly relates to an improved orthopaedic acetabular prosthesis with a reinforcement buttress to provide additional support for a cemented, all polyethylene cup prosthesis.

2. General Background

Acetabular defects have thus been treated by many different methods. Some of these methods include filling the void with bone cement; bone grafting; and implanting bipolar prostheses, custom designed implants, and cementless acetabular components. However, each of these methods has had problems treating massive bone deficiencies. Reinforcement rings are designed to address the failure modes seen in the previously mentioned methods. Reinforcement rings have been used clinically for many years to treat massive bone deficiencies. They can be used with or without bone grafts depending on the degree and position of the defect. Anti-protrusio cages are discussed in an article authored by Berry and Müller, entitled "Revision Arthroplasty Using An Anti-Protrusio Cage for Massive Acetabular Bone Deficiency," Journal of Bone and Joint Surgery, Vol. 74-B, No. 5, September 1992, pp. 711–715.

Some acetabular defects create problems for a surgeon when implanting an acetabular prosthesis. These defects often dictate that a artificial acetabular cavity be created to receive an artificial acetabular socket utilizing a grouting agent to secure the socket in place.

One of the problems with certain patients having pelvic defects is that of a lack of available host bone tissue for receiving and connecting to the prosthesis. Rings are used with screws fixated to either bone graft or host bone. Cement is then used with the "all poly" component.

In bone defect cases, cement does not always have proper support to hold the polyethylene or "poly" liner. Such bone defects can be in the form of gaps in the bone, or columnar defects such as a posterior column defect.

There are a number of commercially available acetabular prosthetic devices that include a cup shaped body. Reinforcement shells include Protek's Müller acetabular roof reinforcement ring and the Howmedica Oh-Harris Protrusio Shell. Reconstruction shells include Protek's H. B. Burch—R. Schneider Reinforcement Cage (C. P. Titanium), Protek's R. Ganz Acetabular Roof Reinforcement Ring with Hook (C. P. Titanium), and Osteonics' Gap Acetabular Cup (C. P. Titanium). Some of these acetabular cups have correspondingly shaped inner and outer concave and convex surfaces. Some devices have projections extending from the outer surface of the cup-shaped body. For example, U.S. Pat. No. 3,939,497 describes a socket for a hip joint prosthesis which is secured to a cavity in the bone tissue by a series of radially arranged pegs which can be projected outwardly from the wall of the socket into the surrounding tissue by a central screw which also has a self-tapping thread that enters the tissue.

European Patent Application No. 169,978 published May 2, 1986, describes an acetabular cup which has an outer shell embedded into the patient's pelvis. The outer shell has a frustro-conical skirt and a spherical central cap.

In European Patent Application No. 211,169 published Feb. 25, 1987, an acetabular cup is described in which an external boss protrudes from the outer surface of the acetabulum body to fit into a pre-drilled hole in the acetabulum.

Other foreign patents and patent applications which describe acetabular cups include European Patent Application No. 212,087 published Apr. 3, 1987, wherein metallic pins project from the surface of the cup and contain holes in which tissue may grow. In European Patent No. 341,198 published Nov. 8, 1989, an acetabular cup has a metal outer shell and a plastic body for retaining the hip joint head.

Some acetabular cup devices have outer surfaces with two differently shaped regions thereon including an annular rim or skirt that is thickened for forming an interference fit with the pelvis. Another acetabular cup (Patent DE 3341723C1) is in the form of a hemispherical socket body that is flattened at the crown region, to ensure lateral wedging of the socket in the pelvic bone.

SUMMARY OF THE INVENTION

The Acetabular Reinforcement/Reconstruction Shell System consists of a "Roof Reinforcement" shell and a "Reconstruction" shell. Both types have multiple screw holes for fixation. Acetabular Reinforcement/Reconstruction Shells are manufactured from commercially pure titanium in a variety of sizes to accommodate the needs of all patients. The metal shell is positioned with screws and then an all polyethylene component is cemented into place. By incorporating a construct that includes a metal shell, screws, cement and an all poly component, the system provides more strength than only cement or bone grafting.

The Reconstruction Shell consist of a full or partial cup shaped device with multiple angled and/or twisted flanges for fixation in the ilium or ischium. This device has a reinforcement cement buttress which acts as a form of support for the cemented all polyethylene cup which is typically left unsupported in this area. A third flange can be fixated to the posterior column.

The present invention thus provides an improved (cemented) acetabular prosthesis that includes a cup body having a thin wall with a cup body wall thickness of about 2 mm. The body has a concave surface, a convex surface, and an annular rim.

The concave surface of the ring allows for the use of a cemented "all poly" component. The polyethylene or "all poly" then accepts the femoral head of a hip stem.

The cup body wall provides a plurality of openings therethrough. Some of these openings are bone screw receptive openings that are reinforced with an annular reinforcement that extends away from the convex surface of the cup body. Others of the openings are openings that allow cement to flow through the concave and convex layers of the cup body. A threaded hole accepts a correspondingly threaded instrument that allows for ring insertion.

A cement mantle is used to affix the plastic liner within the cup body. The cement mantle flows through at least some of the openings upon use of the cup liner. Others of the openings that are reinforced are used for receiving bone screws that attach the cup body to the patient's pelvis.

In a first embodiment (acetabular roof reinforcement shell), at least one curved annularly extending flange extends away from the rim of the cup and helps attach the cup body to the patient's pelvis. The reinforcement buttress helps secure a mass of cement in between the cup body and the polymeric liner.

In a second embodiment (acetabular reconstruction shell), a plurality of radially and circumferentially spaced flanges